GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

Syllabus M.Sc. I Semester

For the Session 2023-24 Max. M. 80

PAPER – I STRUCTURE & FUNCTION IN INVERTEBRATES

1. Classification of invertebrate Phyla up to orders with examples mentioning special features.
2. Locomotion -Types of Psuedopodia & Theories of Amoeboid Locomotion.
   Flagella and ciliary movement in Protozoa.
   Hydrostatic movement in coelenterata, and Echinodermata.
3. Canal system in Porifera Asconoid, Syconoid, Leuconoid.
4. Polymorphism in Coelenterata, Corals and Coral Reef.
5. Nutrition and Digestion.
   Patterns of feeding and digestion in lower metazoan.
   Filter feeding and Digestion in Polychaeta.
6. Respiration
   Organs of respiration: Gills, lungs and trachea, book lung.
   Mechanism of respiration.
7. Excretion
   Organs of excretion: coelom, coelomoduct, and Nedhridia and Malphigian tubules
   Mechanisms of excretion.
8. Water vascular system in Echinodermata
9. Nervous System
   Primitive Nervous System –Coelenterata.
   Advanced nervous system: Annelida and Mollusca (Cephalopodan) Torsion in gastropods.
10. Invertebrate larvae
    Structure and development of Trochophore & its Phylogenetic importance
    Larval forms of crustacean, Echinoderms.

REFERENCE BOOKS

1. Barnes, Invertebrate zoology, Halt-Saunders International.
2. Barrington, E.J.W., Invertebrate structure and function, Nelson.
3. Marshall and Williams, Textbook of Zoology. Vol I Macmillan Co., London.
4. Sedgewick, Textbook of Zoology, Vol I,II, III, Macmillan Co., London
5. Hyman,L.H., The Invertebrates, Vol I-VIII, McGraw Hill Co. New York.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 M.Sc. I Semester Max.M. 80

PAPER – I I BIOSYSTEMATICS , TAXONOMY

1 Definition and basic concept of Biosystematics & Taxonomy.
Historical resume of systematic.
Importance and applications of biosystematics in biology.

2 Trends in Biosystematics
Morphological approach
Embryological approach
Ecological approach
Cytological approach
Biochemical approach

3 Dimensions of speciation and taxonomic characters
Mechanism of speciation in panmictic and apomictic species .
Species concept – species category, different species concepts, sub-species and other infra species categories.
Theories of biological classification , hierarchy of categories.
Taxonomic characters – different kind, origin of reproductive isolation.

4 Procedure keys in taxonomy.
Taxonomic procedures – taxonomic collection, preservation, curetting
Process of I dentification.
Taxonomic keys – different kind of taxonomic keys, their merits and demerits.
Process of typification and different zoology types.
International codes of Zoology nomenclature (ICZN) its operative principle,
Interpretation and application of important rules, Zoological nomenclature

REFERENCE BOOKS

1. Mayr, E. Principles of Systematic Zoology. McGraw Hill Book Co.
2. Simpson, G.G. Principles of Animal Taxonomy. Columbia University Press.
3. Kapoor, V.K. Animal Taxonomy.
4. Tikadar, B.K. Threatened Animals of India. ZSi Publication, Calcutta.
5. Henning, W. Phylogenetic Systematics. University of Illinois Press.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc. I Semester

For the Session 2023-24 Max.M. 80

PAPER – III GENERAL AND COMPARATIVE ENDOCRINOLOGY

1. Aims and scope of endocrinology.
   Hormones as messengers.
   Classification of hormones. (Structural & functional)
   Discovery of hormones.
   Experimental methods of hormone research.
2. Phylogeny of endocrine gland (pituitary, pancreas, adrenal, thyroid)
3. Neuroendocrine system and neurosecretion
4. General principles of hormones action.
   Nature of hormones action.
   Hormone receptor-signal transaction mechanisms.
   Hormones and homeostasis.
   Hormonal regulation of carbohydrate and lipid metabolism.
5. Endocrine role of Pineal gland.
6. Insulin, Glucagon and Diabetes mellitus.
7. Biosynthesis and secretion of hormones:
   Biosynthesis of steroid hormones .
   Biosynthesis and amino acid derived small hormones (eg:T4,epinephrine etc)
8. Hormones and behavior.
   Hormones, Growth and Development.
   Endocrinology of sex differentiation and development.
   Hormones and reproduction.
   Hormones and male reproductive physiology.
   Hormones and Female reproductive physiology.
9. Seasonal breeders.
   Continuous breeders.

REFERENCE BOOKS

1. E.J.W.Barrington, General and Comparative Endocrinology. Oxford,Clarendon Press.
2. P.J.Bentley, Comparative Vertebrate Endocrinology. Cambridge University Press.
3. R.H.Williams, Text Book of Endocrinology. W. B. Saunders.
4. Guyton and Hall, Text Book of Medical Physiology. Saunders.
5. Hadley, Endocrinology. Pearson Education.

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Department of Zoology

M.Sc. I Semester

For the Session 2023-24

Max.M. 80

PAPER – IV MOLECULAR CELL BIOLOGY.

1. Biomembrane.-
   A-Molecular composition ,structural organizations and functions .
   B-various models of plasma membrane.
2. Membrane Function :
   A-Cell Adhesion and junction :CellAdhesion Molecules and their role.
   B-MembraneTransport :Passive and Active transport- ATP-Powered pumps.
   C.Cotrasport by Symporters and antiporters.
3. Cytoskeleton—
   A-Microfilaments in Cell Movements and Locomotion.
   B- Microtubules organization and dynamics,Role of Kinesin and Dynein in Cell movement.
   C. Intermediate filaments.
4. Cell Cycle and its controlling mechanisms;
   checkpoints in Cell cycle Regulation,cdks and cyclins.
5. Cell signalling –
   A-Cell surface receptors and signaling: signal transduction
   B-Signalling pathways at gene level:
   TGFB receptors,Cytokine receptors, Tyrosine kinase receptors and their activation
6. Membrane trafficking—
   A-Movements of Protein intomembranes and organelles-Uptake into ER.
   B-Protein folding and role of Chaperones.
7. Molecular Structure of Genes and Chromosomes:Structural and Functional elements.
8. Protein Synthesis and its regulation.
9. Genetics of cancer:Oncogenes and Tumor Suppressor genes.
10. Biology of ageing: causes, theories and Antiageing Strategies.
11. Apoptosis ,:mechanism , regulation and significance.

REFERENCE BOOKS

1. Darrel,J.,Lodish,H.,Baltimore,D., Molecular Cell Biology. Scientific American Book
2. Alberts,B.,Watson,J.D., Molecular Biology of Cell. Garland Publishers. New York
3. Dobzhansky, Th., The Genetics and Origin of Species.Columbia Univ. Press.
4. Lewin Benjamin, Gene VII. Oxford University Press.UK

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc. I Semester

For the Session 2023-24

Max .M. 100

PRACTICAL - I

Based on Paper I and Paper II

Time 6Hrs

LIST OF PRACTICAL

1. Museum Specimen study from Protozoa to Hemichordata.
2. Permanent slide study of Protozoa to Hemichordata.
3. Mounting of various invertebrate animals/organs/larva.
4. Dissection (Virtual) - Major /Minor – Squilla , Prawn ,Unio, Mytilus ,Loligo, Sepia, Octopus, pila etc.
5. Collection of animals,preservation and curetting of collected specimens.
6. Identification of animals with different types of keys.
7. Composition and assessment of taxonomic diversity / biodiversity in a habitat(grassland , pond etc.)
8. Taxonomic position study of various animals.
9. Taxonomic Keys Exercises

SCHEME OF EXAMINATION

Time : 6

M.M. 100

1. Dissection / Virtual	05
2. Preparation of permanent slide	05
3. Spotting 1 to 10	20
4. Exercise based on Taxonomy	30
5. Viva	20
6. Sessional	20
TOTAL:	**100**

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc.I Semester

For the Session 2023-24 Max.M. 100

PRACTICAL - II
Based on Paper III and Paper IV

Time 6Hrs

LIST OF PRACTICALS

1. Study of endocrine glands in different groups of animals with help of permanent slides
2. Preparation of permanent slides of sections of endocrine glands(Microtomy).
3. Study of prokaryotic and eukaryotic cells.
4. Study of types of cells and tissues.
5. Study of cytological slides- cell division, giant chromosomes, barr bodies,mitochondria.
6. Preparation of cytological slides.
7. Colorimetric estimation of glucose, protein
8. Problem based on Genetics and Molecular Biology.
9. Human Genetical Disorder Diseases.

SCHEME OF EXAMINATION

1.	Microtomy	a. preparation, cutting of blocks	10
		b. stainig of slides	
2.	Spotting 1-10		20
3.	Exercise based on Molecular Biology		25
4.	Preparation of cytological slide		05
5.	Viva		20
6.	Sessional		20
		TOTAL	**100**

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc.II Semester

For the Session 2023-24

Max.M. 80

PAPER – I INSECT PHYSIOLOGY

1. Outline classification of class "INSECTA" up to orders.
2. Head capsule and head segmentation.
3. Structure and function of integument.
4. Mouth parts, structure and variation among various insects and mechanism of feeding.
5. Digestive system and physiology of digestion.
6. Physiology of respiration in aquatic and terrestrial insects.
7. The Circulatory system.
8. Physiology of Excretion.
9. The Nervous system and Neuro-secretions in insects.
10. Visual organs, Sense organs,Effector organs and perception.
11. Male and female reproductive systems,
12. Development
13. The Endocrine functions.
14. pheromones
15. Diapause.

REFERENCE BOOKS

1. A. D. Imms A General Text Book Of Entomology.
2. V.B.Wigglesworth , The Principles Of Insect Physiology.
3. Snodgross , Principles Of Insect Morphology.
4. D. B. Tembhare, Insect Morphology, Physiology And Endocrinology.
5. M.S.Mani, General Entomology.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc.II Semester

For the Session 2023-24

Max.M. 80

PAPER – II POPULATION GENETICS AND EVOLUTION

1 Evolution - Basic concept and historical perspective of organic evolution.
Evidences of evolution.
Theories of Organic Evolution - Lamarckism, Darwinism, Modern Synthetic theory.

2 Evolution of man:

3 Destabilizing forces of evolution- mutation, isolation, natural selection, genetic Drift, migration.

4 Genes in population:
Gene frequency, Genotype Frequency, Gene Pool and Genetic Equilibrium Concept and examples-Hardy Weinberg's law and its application in Evolution

5 Quantitative Genetics-Analysis of quantitative traits, multiple gene and its examples.
Inbreeding depression and heterosis.

6 Basic concepts of species and Speciation
Pattern and models of Speciation,

7 Microevolution, Macroevolution and Mega Evolution
Punctuated Equilibria Hypothesis, Simpson's Grid

8 Molecular Evolution - Gene evolution with reference to haemoglobin, Cytochrome-C
Molecular clock
Phylogenetic tree

REFERENCE BOOKS

1. Dobzhansky, The Genetics and Origin of Species. Columbia University Press.
2. Merrel,D.J., Genetics and Evolution. Holit, Ruchart and Winston Inc.
3. Smith, J.M., Evolutionary Genetics. Oxford Univ. Press.
4. Stickberger, Genetics.
5. Jha, A.P., Genes and Evolution. Joha Publications, New Delhi.
6. Futuyama, Evolutionary biology.
7. Rastogi, Evolutionary biology.
8. Mattler , Erage, Population Genetics And Evolution.
9.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc.II Semester

For the Session 2023-24 Max.M. 80

PAPER – III GAMETIC BIOLOGY

1. An account of differentiation of gonads in mammal
2. Leyding cells.--Morphology
   Differentiation
   Fuctions and its regulation.
3. Spermatogenesis.
8. Biochemisty of semen.--Semen composition and formation.
   Assessment of sperm functions.
5. Fertilization-- Pre fertilization events
   Biochemistry of fertilization.
   Post fertilization events.
6. Collection and cryo preservation of gametes.
7. Ovarian follicular growth and differentiation-- Morphology
   Endocrinology
   Oogenesis and vitellogenesis.
   Ovulation and ovum transport mammals.
8. Multiple ovulation and embryo transfer technology (MOET).
   In vitro oocyte maturation.
   In vitro fertilization
9. Transgenic animals--Production
   Applications
   Embryonic stem cells.
10. Embryo sexing and concept of cloning
11. Immunocontraception –
    contraceptive technologies
    Surgical methods. Hormonal methods.
    Physical barriers.IUCD.

. REFERENCE BOOKS

1. F.T. Longo, Fertilization, Chapman and Hall.
2. R.G. Edwards , Human Reproduction.
3. Guoyton, Reproductive Physiology.
4. A. K. Jain, Reproductive Physiology.
5. A. K. Das, Reproductive Physiology.
6. Ranga, Biotechnology.
7. B.D. Singh, Biotechnology.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 M.Sc.II Semester Max.M. 80

PAPER – IV TOOLS AND TECHNIQUES FOR BIOLOGY

1. Principle and uses of analytical instruments – Balance, pH meter, colorimeter, Spectrophotometer. Centrifuge
2. Microscopy – Principles of transmission- electron –scanning and transmission, phase contrast, fluorescence microscopes.
3. Microbiological techniques.
   Media preparation and sterilization.
   Inoculation and growth monitoring.
4. Cell culture techniques.
   Design and functioning of culture laboratory.
   Cell proliferation measurements.
   cell harvesting methods.
5. Cry techniques.
   Cry preservation for cells, tissue, organisms.
   Cry techniques for microscopy.
6. Separation techniques in biology.
   Molecular separations by chromatography, electrophoresis
   Organelle separation by centrifugation .
7. Immunological techniques based on antigen-antibody interactions.
8. Biosensors.

REFERENCE BOOKS

1. Robert Braun, Introduction to Instrumental Analysis. McGraw Hill International Editions.
2. Purohit, S.S., Agricultural Biotechnology. Agrobios
3. Weesner, General Zoological Microtechniques.
4. Vogels, Text Book of Quantitative chemical Analysis. Pearson Education
5. Purohit, S.S., Biotechnology Fundamentals and Applications. Agrobios
6. Roitt,I.M., Essential Immunology.Blackwell Scintific Publications.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 **M.Sc.II Semester** Max.M. 100

Time 6Hrs

PRACTICAL - I
Based on Paper I and Paper II

LIST OF PRACTICALS

1. Mouth parts of various insects – Slide preparation and study of permanent mounts.
2. Dissection of digestive system and reproductive organs of insects.(virtual)
3. Respiration in aquatic and terrestrial insects – methods and physiology.
4. Diapause – experiment.
5. Population genetics – To study the effect of random mating in a population.
6. Application of Hardy Weinberg Law in calculating gene frequency in a population.
7. Study of various trends / types of Evolution, living fossils, adaptive radiation.

SCHEME OF EXAMINATION

1.	Dissection (Virtual)	10
2.	Exercise based on insect physiology	20
3.	Exercise based on population genetics	10
4.	Exercise based on evolution	10
5.	Identify and comment up on spots 1-5	10
6.	Viva-voce	20
7.	Record/Project/sessional	20
	TOTAL	**100**

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 **M.Sc. II Semester** Max.M. 100

Time 6Hrs **PRACTICAL - II**
Based on Paper III and Paper IV

LIST OF PRACTICALS

a. Study of permanent slides of gonads and endocrine glands.
b. Microtomy - gonads of different vertebrates.
c. Composition of semen.
d. Sperm count.
e. Assessment of sperm function.
f. Contraceptive technologies- surgical, hormonal method, IUCD.
g. Study of different microscopes.
h. Use of balance, colorimeter, pH meter, centrifuge.
i. Molecule separation by chromatography, electrophoresis, media preparation, cell culture.

SCHEME OF EXAMINATION

1.	Exercise on gametic biology	30
2	Colorimetric estimation of biomolecules.	10
3.	Chromatography (paper and thin layer)	10
4.	Application of different types of microscopes, Physical balance,pH meter	10
5.	Viva-voce	20
6.	sessional	20
	TOTAL	**100**

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 M.Sc.III Semester

Max.M. 80

PAPER – I COMPARATIVE ANATOMY OF VERTEBRATES

1. Origin and evolution of chordates.
2. Classification of vertebrates up to orders with example.
3. Vertebrate integument and its derivatives.
   Development , General Structure and function of skin and its derivative.
   Glands, scales, horns, claws, hoofs, feather and hairs.
4. General plan of circulation in various groups.
   Evolution of heart.
   Evolution of aortic arches
5. Respiratory system comparative account of respiratory organs.
6. Skeletal system.
   Comparative account of jaw suspensorium, vertebral column.
   Limbs and girdles.
7. Comparative account of urinogenital system in vertebrates.
8. Nervous system.
   Comparative account of brain and spinal cord in vertebrate series

.

REFERENCE BOOKS

1.Alexander,R.M. The Chordata. Cambridge University Press,London.
2. Kingsley, J.S. Outlinesof comparative Anotomy of Vertebrates. Central Book Depot. Allahabad.
3. Kent,C.G. Comparative Anatomy of Vertebrates.
4. Sedgwick,A.A Student text book of Zoology, vol ii
5.Young,J.Z. Life of Vertebrates.The Oxford University Press, London.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 M.Sc.III Semester Max.M. 80

PAPER – II QUANTITIATIVE BIOLOGY

1. Biostatistics. Scope and importance of Biostatistics.
2. Collection and Presentation of data,
   Tabulation and graphical presentation
3. Frequency Distribution
   General idea about normal and binomial distribution.
4. Measures of Central Tendencies
   Mean, Mode, Median,
5. Measures of Dispersion
   Range
   Mean Deviation
   Standard error,
   Standard deviation
6. Probability theory. Probability distribution and their properties
7. Hypothesis testing
   t-test,
   f – test.
   chi-square test.
8. Analysis of variance
9. Correlation (Simple)
10. Regression (Linear)

REFERNCE BOOKS

1. Elhance, Statistics.
2. Banerjee, P.K. A Textbook of Biometry. Chand, S.
3. Prasad, S. Elements of Biostatistics. Rastogi Publications.

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Department of Zoology

For the Session 2023-24 M.Sc.III Semester Max.M. 80

PAPER – III ANIMAL BEHAVIOUR

1. Introduction
   Ethology as a branch of biology (History of ethology).
   Methods of Studying Behaviour.
2. Neural and hormonal control of behavior.
3. Irritability and Conduction.
4. Stereotyped Behaviour
5. Communication –Chemical, Visual and Audio
   Species specificity of songs.
6. Evolutionary aspects of Social Organization
7. Social behaviour in monkeys.
8. Ecological aspects of behavior.
   Food selection and feeding behaviour, optimal foraging theory, antipredator defenses.
   Aggression, territoriality.
9. Social behavior—Migratory bevaviour in birds.
   Herding in mammals.
   Social organization in insects and primates.
10. Reproductive behavior.--Mating system.
    Courtship.
    Sexual selection.
11. Pheromones.
12. Learning and memory.—Conditioning and Learning.
    Habituation.
    Reasoning.
13. Human Ethology.

REFERENCE BOOKS

1. Alcock, J. Animal Behaviour : An Evolutionary Approach. Sinaver Assoc.,Sunderland,
2. Clutton Brock, T.H., The Evolution of Parental Care.Princeton University Press. USA
3. Wilson,E.O. Sociobiology: The New Synthesis. Harvard University Press. USA.
4. Mc Farland Animal Behavior. Pitman.
5. M.P.Arora Animal Behavior Himalaya Publishing House.
6. Ranga., M.M. Animal Behavior Agrobios.
7. Hoshang S. Gundevia. A. Textbook of Animal Behaviour; S. Chand & Company Ltd.
8. N. Tinbergen. Social Behaviour in Animals: J.P. Publishing.
9. V.G.Dethier, Eliot Stellar. Animal Behaviour; Foundation of Modern Biology Series.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 M.Sc.III Semester

Max.M. 80

PAPER – IV POPULATION ECOLOGY

1.Population:
   Basic concept and characteristics
   Population density,population growth rate, natality ,mortality.
   Survivorship curves, life table.
2. Biotic potential,carrying capacity.
   Population growth form and various models.
3. Impact and interaction of Ecological factors on Population-
   Light , Temperature, Humidity, Soil.
4. Concept of Limiting Factors- Liebig's Law, Shelford's Law.
5. Population interactions:
   Positive interactions - commensalism,mutualism,cooperation,plant animal Interaction.
   Negative interactions-predation,parasitism,competition,Gause`s principle.
6. Population regulation:
   Density dependent and density independent factors and its mechanism.
7. Human population growth:
   Major causes,problems and control measures
   Demography,and its significance.

REFERENCE BOOKS

1. Kormondy, Concepts of Ecology, Prentis Hall of India, New Delhi.
2. Odum, E.P., Fundamentals of Ecology. Saunders.
3. Krebs, Charles J., Ecology. Addison Wesley Longman.
4. Townsend, Harper, Begon, Essentials of Ecology. Library of Congress Catalogue.
5. Sharma, P.D., Environmental Biology. Rastogi Publications, Meerut.
6. Sharma, P.D., Ecology and Environment Rastogi Publications, Meerut.
7. Mukherjee, B. Environmental Biology
8. Krishna, N.T. Environmental Biology
9.

SN	NAME	SIGNATURE	SN	NAME	SIGNATURE
1	Dr Rashmi Sao		5	Shri A.K.Mahisar	
2	Dr Shubhada Rahalkar		6	Smt Sunita Shukla	
3.	Dr Renu Maheshwari		7.	Dr S.K.Agrawal	
4	Dr D, Mishra				

GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 **M.Sc. III Semester** Max.M. 100

Time 6Hrs **PRACTICAL - I**
Based on Paper I and Paper II

LIST OF PRACTICALS

1. Study of museum specimens (Protochordata to mammalia)
2. Study of permanent slides of different organs.(comparative-skin,liver,pancreas,lung,kidney,testis,ovary spinalcord,endocrine glands.)
3. Dissection (Virtual) of vertebrate animals (scoliodon,rat,snake,bird)
4. Comparative osteological studies.
5. Preparation of permanent mount (Microtomy).
6. Exercise based on biostatistics – central tendencies, T-test,chi-square test,F-test,regression,variance.
7. Tabulation and presentation of data.

SCHEME OF EXAMINATION

1.	Dissection /Virtual	05
2	Slide preparation.	05
3	Exercise on biostatistics	30
6.	Spotting - 1-8	20
7.	Viva	20
8.	Sessional	20
	TOTAL	**100**

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1	Dr Rashmi Sao	Rashmi	5	Shri A.K.Mahisar	
2	Dr Shubhada Rahalkar		6	Smt Sunita Shukla	
3.	Dr Renu Maheshwari		7.	Dr S.K.Agrawal	
4	Dr D, Mishra				

GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 **M.Sc. III Semester** Max. M. 100

Time 6Hrs

PRACTICAL - II

Based on Paper III and Paper IV

LIST OF PRACTICALS

1. Various tactic responses earthworm/grain pest.
2. Food preferences/light &humidity responses of tribolium or other pest.
3. Various behavioral pattern of cricket.
4. Courtship behavior in fruit fly (Drosophila).
5. Feeding behavior in Garden Snail.
6. Reproductive behavior in Fishes.
7. Estimation of population density of Tribolium or other pest.
8. Study of Zooplanktonic/Benthic community of pond at different sites.
9. Physicochemical analysis of different soil sample.
10. Estimation of effect of various pollutants /chemicals on biological sample.
11. Study of the mortality in different organisms with reference to various population regulating parameters in laboratory.

SCHEME OF EXAMINATION

1	Exercise based on behaviour	(i)	15
		(ii)	10
2	Exercise based on ecology	(i)	15
		(ii)	10
3.	Project work		10
4.	Viva		20
5.	Sessional		20
		TOTAL	**100**

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1	Dr Rashmi Sao	Rashmi	5	Shri A.K.Mahisar	
2	Dr Shubhada Rahalkar	Rahalkar	6	Smt Sunita Shukla	Sunita
3.	Dr Renu Maheshwari		7.	Dr S.K.Agrawal	
4	Dr D, Mishra				

GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24 M.Sc.IV Semester

Max.M. 80

PAPER – I REPRODUCTIVE PHYSIOLOGY OF HUMAN BEING

1. Reproduction of primary and secondary sexual organs.
2. Gametogenesis:
   Spermatogenesis and Oogenesis.
   Structure and development of acrosome of sperm and its role in spermatoleosis.
3. Biochemical aspects of fertilization.
4. Synthesis, chemical nature and role of male hormones.
5. Synthesis chemical nature and role female hormones (estrogen).
6. Sex – Chromosomes including Barr body. Monosomic trisomic syndrome.
7. Pregnancy and its hormonal control.
8. Puberty, menstrual cycle, menopause.
9. Parturition and lactation mentioning the role of hormones.
10. Structure and function of placenta.
11. Special features of foetal physiology.
12. Special feature of neonatal physiology.

REFERENCE BOOKS

1. A. K. Das, Reproductive Physiology.
2. Ranga, Biotechnology.
3. B.D. Singh, Biotechnology.
4. C.C. Chatterjee, Animal Physiology , Vol II.
5. I. B. Singh, Human Embryology.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24

M.Sc. IV Semester

Max.M. 80

PAPER II ENVIRONMENTAL PHYSIOLOGY

1. Adaptation and its Kinds:
   a. Structural Adaptations- Cursorial, Fossorial, Desert, Volant, Aquatic, Deep Sea
   b. Protective Adaptations- Coloration and mimicry
2. Physiological adaptation to different environments:
   a. Aquatic-Marine, Fresh water
   b. Terrestrial-Aerial, Desert
   c. Inter specific Association- Mutualism, Parasitism
3. Basic concept of environmental stress & strain and their effects on organisms:
   a. Stress resistance - avoidance and tolerance.
   b. Acclimation and Acclimatization.
4. Concepts of homeostasis:
   a. Mechanisms of Thermoregulation,
   b. Mechanism of Osmoregulation in Aquatic and Terrestrial Organisms
5. Physiological response to oxygen deficient stress in Aquatic and Terrestrial Organisms
6. Physiology of Sports Persons: Body Exercise, Nutrition, and Physiotherapy
7. Meditation, Yoga and their effects on Human Beings

REFERENCE BOOKS

1. Mukherjee, B. Environmental Biology
2. Krishna, N.T. Environmental Biology
3. Hoar,W.S.,General and Comparative Animal Physiology, Prentis Hall.
4. Prosser, C.L., Environmental and Metabolic Animal Physiology, Wiley- Liss Inc.
5. Martin, Endocrine Physiology. Oxford Univ. Press.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc.IV Semester

For the Session 2023-24

Max.M. 80

ELECTIVE PAPER I FISHES (ICTHYOLOGY)

Ostracoderms. Evolution and phylogeny of Fishes.
Adaptive Radiation in teleosts.
Origin and evolution of paired fins.
Types of caudal fin.
Mechanism of locomotion.
Skin. Scales.
Jaw suspension, girdles and vertebrate.
Accessory Respiratory organs.
Airbladder.
Weberian ossicles.
Doctrine of Nerve components.
Accoustico lateralis system.
Reproductive system.
Parental care in Fishes.
Electric organs.
Migration.
Adaptation of Hill stream fishes.
Adaptation of deep sea fishes.

REFERENCE BOOKS

1. Hoar and Randall, Fish Physiology. Academic Press.
2. Berg, Classification of Fishes.
3. Jordan, Genera of Fishes and Classification of Fishes.CBD.
4. Kyle, Biology of Fishes, RPD.
5. Khanna An Introduction to Fishes. CBD
6. Parihar, Fish Biology and Indian Fisheries. CPH
7. Gupta, Gupta, General and Applied Icthyology. S.Chand.

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

M.Sc.IV Semester

For the Session 2023-24

Max.M. 80

ELECTIVE PAPER II AQUACULTURE AND FISHERIES

1. History of classification of fishes, classification of cyprinidae and siluridae.
2. General organization, affinities of holocephali, coelocanth,Dipnoi.
3. Introduction of Major carps.
4. Exotic Fishes.
5. Larvivorous fishes of India.
6. Marine and Estuarine fisheries.
7. Establishement of fish farm and maintenance of nursery, rearing and stocking ponds.
8. Physiochemical and biological conditions of fishery water.
9. Composite fish culture.
10. Paddy cum fish culture.
11. Plankton and fish production.
12. Fish by product.
13. Aquarium maintenance.
14. Fish disease.
15. Fishing gear and crafts like boats, nets etc.
16. Induced Breeding methods like Bandh and hormonal method.

REFERENCE BOOK

1. Berg, Classification of Fishes.
2. Jordan, Genera of Fishes and Classification of Fishes.CBD
3. Shammi Bhatnagar, Applied Fisheries Agrobios
4. Dholakia, Fisheries and Aquatic Resources of India. Daya Publishing House.
5. Biswas, K.P., Industrial Fisheries. Daya Publishing House
6. Gupta, Gupta, General and Applied Icthyology. S.Chand
7. Khanna An Introduction to Fishes. CBD
8. Jhingran, Fish and Fisheries of India. HPC
9. Day, Fishes of India. Today and Tomorrow.
10. Shrivastav, Fishes of U.P.and Bihar.
11. Shrivastav, A TB of Fishery Science and Indian Fisheries. Kitab Mahal.
12.

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3.	Dr Renu Maheshwari		7.	Dr S.K.Agrawal	
4	Dr D, Mishra	D Mishra			

GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24

M.Sc. IV Semester

Max.M. 100

Time 6 Hrs

PRACTICAL - I
Based on Paper I and Paper II

LIST OF PRACTICALS

a. Exercise based on sex chromosomes : Barr bodies, Drumstick chromosomes in WBC.
b. Various types of placenta in mammals.
c. To study the changes in blood glucose level under various environment condition.
d. Study of adaptations- primary and secondary, desert, aerial, parasitic mode of life among various animals.
e. Physiological responses to body exercise.
f. Yoga and its effects.
g. Study of toxicity of given chemical- determination of LD-50 and LC-50 using a fish.

SCHEME OF EXAMINATION

1. Identification of sex through blood analysis	10
2. Determination of changes in blood glucose level	15
3. Determination of toxicity of chemical/ecology/physiology	15
4. Comment on spots (1- 5)	20
5.. Viva	20
6.. Sessional	20
TOTAL	**100**

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GOVT. E.R.R. SC.P.G. COLLEGE, BILASPUR, (C.G.)

Department of Zoology

For the Session 2023-24

M.Sc. IV Semester

Max.M. 100

Time 6 Hrs

PRACTICAL – II (FISHES)

Based on Paper III and Paper IV

LIST OF PRACTICALS

1. Major dissection of nerves of local fishes
2. Minor dissection of weberian ossicles,accessory respiratory organs, Eletric organ.
3. Age determination of fishes by scales.
4. Collection and study of animal diversity with special reference to fishes of Chhattishgarh/Project work.
5. Identification of fresh water fishes.
6. Study of Museum specimens, Osteology, Histology of fishes.
7. Permanent mounting of scale, ampullae of Lorenzini.etc.
8. Microtomy.
9. Visit of fishing industries – Fresh water ,Marine .
10. Study of Fishing gears/nets.
11. Study of fish diseases.
12. Aquarium maintenance

SCHEME OF EXAMINATION

Time: 6 Hrs

		M.M. 100
1.	Major dissection	15
2.	Age determination /Permanent mounting	05
3.	Spot (1-10)	20
4.	Fish Identification	20
5.	Collection and Study of fish diversity	10
6.	Viva-voce	10
7.	Sessional	20
	Total:	**100**

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1	Dr Rashmi Sao		5	Shri A.K.Mahisar	
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3.	Dr Renu Maheshwari	25.11.23	7.	Dr S.K.Agrawal	
4	Dr D, Mishra				